

What Is Claimed Is:

1. An actuator control apparatus, comprising:

first state value ascertaining means, which ascertains a first state value which changes according to the action of an actuator;

second state value ascertaining means, which ascertains a second state value different from the first state value which changes according to the action of the actuator; and,

operation amount determining means, which uses a first response specifying control capable of variably specifying the attenuation behavior and attenuation speed of a deviation of the first state value from a first target value such that said first state value matches the first target value, taking at least the deviation as a first state amount, to determine a first operation amount to drive said actuator such that the first state amount is made to converge on an equilibrium point on a first switching function stipulated by a first linear function which takes as a variable the first state amount, and which determines the response characteristic of said first response specifying control such that said second state value matches a second target value.

2. The actuator control apparatus according to Claim 1, wherein said operation amount determining means uses a second response specifying control capable of variably specifying the attenuation behavior and attenuation speed of a deviation of said second state value from said second target value, taking

at least the deviation as a second state amount, to determine the response characteristic of said first response specifying control such that the second state amount is caused to converge on an equilibrium point on a second switching function stipulated by a second linear function which takes as a variable the second state amount.

3. The actuator control apparatus according to Claim 2, wherein said operation amount determining means determines the response characteristic of said first response specifying control by modifying a computation coefficient of said first linear function.

4. The actuator control apparatus according to Claim 3, wherein said operation amount determining means takes said computation coefficient as a second operation amount, and determines the second operation amount such that said second state amount is made to converge on an equilibrium point on said second switching function.

5. The actuator control apparatus according to any one of Claims 1 through 4, wherein said actuator comprises a driving source which moves a moveable body, said first state value comprises the position of motion of said moveable body, and said second state value comprises the magnitude of the force acting on said moveably body through action of said actuator.

6. The actuator control apparatus according to Claim 5, comprising:

means for controlling an action of a contact mechanism comprising a contact body provided moveably along one shaft direction, said actuator connected to the contact body to move the contact body, and a contacted body which makes contact with the contact body when the contact body moves to a prescribed position, and executing a process of moving, by means of said actuator, said contact body past said prescribed position to press against said contacted body;

target position setting means which sets the target position of said contact body in said process as said first target value;

as said first state value ascertaining means, actual position ascertaining means which ascertains the actual position of said contact body as said first state value; and,

as said second state value ascertaining means, pressing force ascertaining means which ascertains, as said second state value, the pressing force of said contact body against said contacted body.

7. The actuator control apparatus according to Claim 6, wherein said actuator comprises an electrical actuator the output of which changes according to the magnitude of a supplied current, said first operation amount comprises the voltage supplied to the electrical actuator, and said pressing force ascertaining means detects the current supplied to the electrical actuator and ascertains the pressing force of said

contact body against said contacted body based on the supplied current.

8. The actuator control apparatus according to Claim 7, wherein said contact mechanism comprises a synchronizing mechanism which switches between power transmission and disconnection; and,

said contact body comprises a first engaging member, provided integrally rotatably on a shaft, and said contacted body comprises a synchronizing member, provided on said shaft between a second engaging member capable of relative rotation and immovably along the shaft and the first engaging member, capable of rotation relative to the first engaging member and the second engaging member and capable of movement in said shaft direction, which by means of a friction force occurring when in contact with the first engaging member and the second engaging member in a state in which said shaft is rotating, is capable of synchronizing the rates of revolution of the first engaging member and the second engaging member, and of engaging the first engaging member and the second engaging member.

9. An actuator control apparatus, comprising:

first state value ascertaining means, which ascertains a first state value which changes according to the action of an actuator;

second state value ascertaining means, which ascertains a second state value differing from the first state value which changes according to the action of the actuator; and,

operation amount determining means, which uses response specifying control capable of variably specifying the attenuation behavior and attenuation speed of a deviation of the first state value and a first target value such that said first state value matches the first target value, to determine the operation amount to drive said actuator such that the value of a switching function stipulated by a linear function is made based at least on the deviation to converge on zero, and in addition performs switching, according to said first state value or to said second state value, to set the response characteristic of said response specifying control either according to said first state value, or such that said second state value matches a second target value.

10. The actuator control apparatus according to Claim 9, wherein said operation amount determining means sets the response characteristic of said response specifying control by modifying a computation coefficient of said linear function.

11. The actuator control apparatus according to Claim 9 or Claim 10, wherein said actuator comprises a driving source which moves a moveable body, said first state value comprises the position of motion of said moveable body, and said second state value comprises the magnitude of the force acting on said moveable body through the action of said actuator.

12. The actuator control apparatus according to Claim 11, comprising:

means for controlling an action of a contact mechanism comprising a contact body provided moveably along one shaft direction

means for controlling an action of a contact mechanism comprising a contact body provided moveably along one shaft direction, said actuator connected to the contact body to move the contact body, and a contacted body which makes contact with the contact body when the contact body moves to a prescribed position, and said actuator control apparatus executing a first process of moving, by means of said actuator, from a state in which said contact body and said contacted body are in an opposing state with an interval therebetween, said contact body to press against said contacted body, and a second process, in succession to the first process, of moving, by means of said actuator, said contact body past said prescribed position to press against said contacted body;

target position setting means which sets the target position of said contact body in said first process and in said second process;

as said first state value ascertaining means, actual position ascertaining means which ascertains the actual position of said contact body as said first state value;

as said second state value ascertaining means, pressing force ascertaining means which ascertains, as said second

state value, the pressing force of said contact body against said contacted body; and,

said operation amount determining means, in said first process, sets the response characteristic of said response specifying control according to the actual position of said contact body, and in said second process, sets the response characteristic such that the pressing force ascertained by said pressing force ascertaining means matches the prescribed target pressing force.

13. The actuator control apparatus according to Claim 12, wherein, when in said first process the degree of deviation of the actual position of said contact body from said target position increases to greater than a first prescribed level, said operation amount determining means initiates processing to set the response characteristic of said response specifying control such that the pressing force ascertained by said pressing force ascertaining means matches said target pressing force.

14. The actuator control apparatus according to Claim 13, wherein, when in said second process the degree of deviation of the actual position of said contact body from said target position decreases to greater than a second prescribed level, said operation amount determining means determines said operation amount such that movement of said contact body is halted.

15. The actuator control apparatus according to Claim 14, wherein, when in said second process the degree of deviation of the actual position of said contact body from said target position decreases to greater than said second prescribed level, said operation amount determining means sets the response characteristic of said response specifying control in the direction of increasing ability to suppress disturbances.

16. The actuator control apparatus according to Claim 15, wherein said operation amount determining means ascertains the degree of deviation of the actual position of said contact body from said target position based on the converted value resulting from filtering of time-series data of the deviation of the actual position of said contact body and the target position using a wavelet transform.

17. The actuator control apparatus according to Claim 16, wherein said contact mechanism comprises a synchronizing mechanism which switches between power transmission and disconnection; and,

said contact body comprises a first engaging member, provided integrally rotatably on a shaft, and said contacted body comprises a synchronizing member, provided on said shaft between a second engaging member capable of relative rotation and immovably along the shaft and the first engaging member, capable of rotation relative to the first engaging member and the second engaging member and capable of movement in said shaft direction, which by means of the friction force



occurring when in contact with the first engaging member and the second engaging member in a state in which said shaft is rotating, is capable of synchronizing the rates of revolution of the first engaging member and the second engaging member, and of engaging the first engaging member and the second engaging member.